



Diagnosis and treatment of altered passive eruption: esthetic, restorative and hygienic concerns

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Introduction

In the military dental practice, every effort is made to address the dental needs of active duty members. However, due to deployments, training commitments, and at times a patient's dental anxiety, esthetic issues may be left untreated. One such issue which may not be addressed until later in a patient's career is short clinical crowns. Common causes of short clinical crowns include coronal destruction due to traumatic injuries, caries, or incisal attrition as well as from altered passive eruption.¹ Normally when young recruits enter the military service eruption of their dentition is often complete. However, some patients may present with short clinical crowns above the gingiva making restorative and fixed prosthodontic dentistry challenging.² In certain cases, excess gingival tissue may interfere with oral hygiene and plaque accumulates, resulting in gingival inflammation.^{3,4} This update will address the role of altered passive eruption in causing short clinical crowns, provide proper diagnostic information, highlight the essential clinical points to be observed, and present different treatment options for the restorative dentist.

Background

To better understand altered passive eruption we first must define what is considered normal tooth eruption. Tooth eruption is divided into two phases, active and passive.^{5,6} Active eruption is the vertical movement of teeth towards the occlusal plane and is believed to be continuous throughout life (prefunctional eruption of the permanent teeth towards the occlusal plane and functional eruption due to continuous attrition throughout life). Passive eruption is the gradual apical migration of the dentogingival junction (epithelial attachment) following tooth eruption. Figure 1 divides passive eruption into four stages corresponding to the position of the epithelial attachment to the cemento-enamel junction (CEJ):⁵

- Stage 1: Epithelial attachment (EA) is located on enamel.
- Stage 2: Epithelial attachment is located on enamel and cementum.
- Stage 3: Epithelial attachment is located on cementum with coronal contact with CEJ.
- Stage 4: Epithelial attachment is located on cementum apical to CEJ.

Together, active and passive eruptions of the teeth and dento-gingival complexes, respectively, adjust for tooth eruption, skeletal growth and attrition of the incisal edges.

Altered passive eruption: diagnosis

When passive eruption does not progress beyond Stage 1 or 2 it is referred to as *altered* or *delayed*.⁶ The incidence of this condition in the general public varies; however, it is generally about 12%.^{3,7}

Diagnosing a case as altered passive eruption involves evaluating the age of a patient, the sulcus depth of the tooth or teeth and the clinical crown length(s). The age of a patient is significant, as the anterior teeth undergo passive eruption in the early teen years, whereas the posterior teeth may not reach this point until the patient is in their 20s. In normally erupted teeth, the CEJ lies just apical to the gingival margin of the anatomic crown and the sulcus depth measures 1-3mm⁸. The sulcus is defined as the area from the gingival margin to the most coronal aspect of the junctional epithelium (epithelial attachment). In cases of altered passive eruption, the CEJ may be as much as 5 mm apical to the gingival margin resulting in a short-looking tooth.³ If there are neither pathologic nor cosmetic problems, then no corrective treatment may be needed. However, if the excess gingival tissue due to altered passive eruption interferes with oral hygiene, plaque may accumulate causing gingival inflammation which may eventually lead to increased probing depths. Also, altered passive eruption can make the restoration of teeth difficult when excessive soft tissue around the teeth interferes with placement of interproximal restorations. In such cases, corrective treatment is necessary.⁴

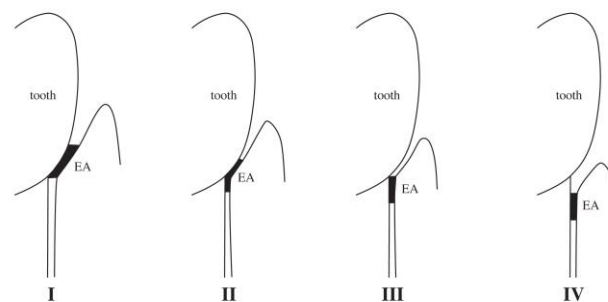


Figure 1: Stages of passive eruption as defined by Gargiulo. The solid black line represents the dentogingival unit (epithelial attachment, or EA). During passive eruption this unit migrates apically along the tooth.⁵

Altered passive eruption: clinical points

Before surgical therapy to correct altered passive eruption is performed, the patient must undergo initial scaling and root planing. This will reduce gingival inflammation and allow for an accurate assessment of the amount of reduction of gingival and osseous tissues needed. Treatment of short clinical crowns due to altered passive eruption begins with a few essential clinical points.²

1. *Clinical crown height* must be determined. This is accomplished by first locating the CEJ with an explorer to determine the actual length of the crown. When the CEJ is not detectable in the sulcus, a periodontal probe is placed to the base of the sulcus; the measurement from the incisal edge to the base of the sulcus can be used as the crown height as the CEJ is

approximately at the base of the pocket in altered passive eruption.

2. *Level of bone in reference to the CEJ* is then assessed. The radiograph serves as a valuable tracer for the level of the crest of bone.¹ A more accurate method to determine bone level is through bone sounding. The gingiva is anesthetized and a periodontal probe is then pushed through the attachment apparatus until the alveolar crest is engaged. This measurement is subtracted from the sulcus measurement (CEJ level) to determine the amount of distance from the CEJ to the bone. In altered passive eruption, this measurement may be less than 2mm.³

3. *Keratinized tissue around the tooth* ideally should be present to maintain health.⁹ Therefore, an adequate zone of keratinized tissue should remain following surgical correction of altered passive eruption.

Altered passive eruption: treatment

1. *Gingivectomy*

If the crestal bone to gingival margin distance is greater than 3mm, a gingivectomy is indicated. In this instance, there is more than the required 2mm minimal distance between crestal bone and CEJ (biologic width). The initial incision should be placed at the diagnostic level of the CEJ and the initial incision should reflect the normal gingival contour.

2. *Apically positioned flap with osseous surgery*

When bone sounding reveals less than 2mm distance between the crestal bone and CEJ, a gingival flap with osseous surgery is indicated. If the gingival heights of the anterior teeth are asymmetric, the gingivectomy-type incision must be performed first so that the final tissue contours will be symmetrical. If the marginal tissue contours are symmetrical, a sulcular incision can be used and the flap then apically positioned. The incision cuts may be made across the facial surfaces of each papilla, leaving the papilla intact interproximally. Then, a full-thickness flap is elevated beyond the mucogingival junction, and the positions of the CEJs are visually verified. Osteotomy is performed to create an approximate 2 - 2.5mm distance between the crestal bone and CEJs.

The bony architecture should reflect exactly the desired soft tissue architecture. The gingiva is then apically repositioned to CEJ levels and sutured.

For patients who require full-coverage restorations with intracrevicular margins and the osseous crest is at the CEJ, it is necessary to perform osseous resection with apically positioned flap surgery to create a space for the JE and gingival connective tissue attachment (biologic width).² This involves flap reflection on the facial, lingual and interproximal surfaces of the teeth to allow for proper access for osteotomy.

Healing

Following surgical therapy, healing time of the periodontium varies from a few weeks to more than six months if crowns are treatment planned.^{4,10,11} Posterior teeth generally do not require as long of a healing period as anterior teeth because they are outside the esthetic zone, therefore restoration of these teeth may begin within 5-6 weeks post-surgery since the limiting factor is periodontal wound healing and not

establishment of a stable gingival margin.² Esthetic areas requiring crowns, however, require longer healing times due to the time needed to establish a stable gingival margin following surgery, which can take as long as six months.¹¹

Conclusion

Altered passive eruption is one cause of short clinical crowns. With proper diagnosis (by taking into account the patient's age, sulcus depth, and clinical crown lengths) and in assessing essential clinical points (clinical crown height, level of bone in reference to the CEJ, the presence of keratinized tissue around the tooth) short clinical crowns due to altered passive eruption can adequately be treated with either a gingivectomy or apically positioned flap with osseous surgery, and a successful esthetic, restorative or hygienic outcome can be achieved.

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